Claims:

1.   A method of detecting double-talk and path changes in an echo cancellation system, comprising:

generating a correlation-based matrix of signals in said echo cancellation system; and

analyzing said correlation-based matrix to identify double-talk and path changes occurring in said system.

2.   A method as claimed in claim 1, wherein said correlation-based matrix is generated using zero-lag auto and cross-correlations of said signals.

3.   A method as claimed in claim 2, wherein a determinant of said matrix is used to detect said double-talk and path changes.

4.   A method as claimed in claim 3, wherein said double-talk and path changes are inferred when the value of said determinant passes predetermined threshold values.

5.   A method as claimed in claim 2, wherein eigendecompositions of said matrix are used to detect said double-talk and path changes.

6.   A method as claimed in claim 2, wherein single valued decompositions of said matrix are used to detect said double-talk and path changes.

7.   A method as claimed in claim 2, wherein condition numbers of said matrix are used to detect said double-talk and path changes.

8.   A method as claimed in claim 1, wherein said echo cancellation system includes an adaptive filter, and said signals comprise an echo signal and an output of said adaptive filter.

9.   A method as claimed in claim 8, wherein said filter is an LMS filter.

10.   A method as claimed in claim 9, wherein said LMS filter implements a normalized-LMS algorithm.

11.   A method as claimed in claim 1, wherein the elements of said correlation-based matrix are generated in the time domain.

13

12.   A method as claimed in claim 1, wherein the elements of said correlation-based matrix are generated in the frequency domain.

13.   A method as claimed in claim 3, wherein said determinant $\mathbb{R}$ is of the form

$$\mathbb{R} = E\begin{bmatrix} X_0 X_0^T & X_0 X_1^T \\ X_1 X_0^T & X_1 X_1^T \end{bmatrix}$$

5   wherein $X_0[n]$ and $X_1[n]$ are generated by a linear combination of two real-valued source signals, $S_0[n]$ and $S_1[n]$.

14.   A method as claimed in claim 1, wherein $S_0[n]$ comprises an echo signal and $S_1[n]$ comprises a cancellation signal.

15.   A double-talk and path change detector, comprising:

10   a processing element generating a correlation-based matrix of signals in said echo cancellation system; and

a processing element for analyzing said correlation-based matrix to identify double-talk and path changes occurring in said system.

16.   A double-talk and path change detector as claimed in claim 15, wherein said

15   correlation-based matrix is generated using zero-lag auto and cross-correlations of said signals.

17.   A double-talk and path change detector as claimed in claim 16, wherein a determinant of said matrix is used to detect said double-talk and path changes.

18.   A double-talk and path change detector as claimed in claim 16, wherein said

20   double-talk and path changes are inferred when the value of said determinant passes predetermined threshold values.

19.   A double-talk and path change detector as claimed in claim 16, wherein eigendecompositions of said matrix are used to detect said double-talk and path changes.

20.   A double-talk and path change detector as claimed in claim 16, further comprising

25   an adaptive filter, and said signals comprise an echo signal and an output of said adaptive filter.

14

21.   A double-talk and path change detector as claimed in claim 20, wherein said filter is an LMS filter.

22.   A double-talk and path change detector as claimed in claim 17, wherein said determinant (**R**) is of the form

$$\mathbf{R} = E \begin{bmatrix} X_0 X_0^T & X_0 X_1^T \\ X_1 X_0^T & X_1 X_1^T \end{bmatrix}$$

wherein $X_0[n]$ and $X_1[n]$ are generated by a linear combination of two real-valued source signals, $S_0[n]$ and $S_1[n]$.